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DEVELOPMENT AND EVALUATION OF A NEW ACB AND APTITUDE AREA SYSTEM

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Army Behavior and Systems Research Laboratory
Arlington, Virginia

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Milton H. Maier and Edmund F. Fuchs

MILITARY SELECTION RESEARCH DIVISION

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Army personnel managers have a continuing need to select, classify, and assign to training and jobs large numbers of men who enter the service. Since the Army Classification Battery (ACB) is an integral part of the assignment process, accuracy of scores has a significant influence on the appropriateness of assignment. BESRL's DIFFERENTIAL CLASSIFICATION Work Unit has an ongoing research program to keep the classification battery effective and up to date. As part of the overall effort, a new ACB and aptitude area system have been developed which result in an improved system of classification for training and jobs. The description of the new psychological test battery and aptitude areas and an assessment of their effectiveness in relation to the utilization and performance of Army enlisted input is given in Technical Research Report 1177. The present publication deals with BESRL research conducted to evaluate a large number of tests as predictors of success in the different groups of Military Occupational Specialties (MOS) and to select tests for aptitude area composites.

Experimental tests and tests of the operational ACB (administered to about 25,000 men in over 100 MOS training courses) were evaluated against performance in the training courses. Validity coefficients of the variables with final course grades in the MOS courses were computed and corrected to reflect population values. Regression equations for all tests were computed in each MOS sample, and for each MOS group a sequence of test selections was performed to determine which tests contributed significantly to validity. These statistical analyses resulted in a test battery of 16 measures and the formulation of 9 aptitude areas designated as selectors for 9 MOS

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groups. Each aptitude area consisted of from three to five tests, each unit-weighted. Finally, through simulation runs, estimates were derived of operational effects of introducing the new classification system.

Findings indicate the new Army Classification Battery and aptitude areas to be superior to the previous system. Average validity of the new aptitude area composites across all MOS groups is higher than that of the previous composites. Supporting statistical analyses are provided in detailed tables in appendixes to the Research Note.

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BESRL Technical Research Reports and Technical Research Notes are intended for sponsors of R&D tasks and other research and military agencies. Any findings ready for implementation at the time of publication are presented in the latter part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or Disposition Form.

FOREWORD

The DIFFERENTIAL CLASSIFICATION Work Unit applies psychological measurement methods to enable the Army to make best use of the skills and aptitudes of its enlisted personnel through increasingly accurate and differentiated measures of individual potential. Research is conducted to maintain and improve the effectiveness of the Army Classification Battery and related techniques and of conditions which may interact with the classification tests and thus affect the basis for utilization of the enlisted input--changes in training programs and job content and environment, for example.

As part of the overall effort, a new Army Classification Battery and new aptitude areas have been developed which result in an improved system of classification for training and jobs. The present Technical Research Note deals with BESRL research conducted to evaluate a large number of tests as predictors of success in the different groups of Military Occupational Specialties and to select tests for aptitude area composites.

The entire research work unit is responsive to special requirements of the Deputy Chief of Staff for Personnel and the U. S. Continental Army Command, as well as to objectives of Army RDT&E Project 2Q062106A722, "Selection and Behavioral Evaluation," FY 1972 Work Program.

J. E. Uhlaner

J. E. UHLANER, Director
Behavior and Systems
Research Laboratory

DEVELOPMENT AND EVALUATION OF A NEW ACB AND APTITUDE AREA SYSTEM

BRIEF

Requirement:

To develop and evaluate a new Army Classification Battery (ACB) and new aptitude area composites for use in the selection of enlisted men and their classification to training and jobs.

Procedure:

Experimental and operational tests made up a battery administered to about 25,000 men in over 100 Army Military Occupational Specialty (MOS) training courses. Validity coefficients of experimental and operational test variables with final course grades in the MOS courses were computed. Coefficients were corrected to reflect population values. Regression equations for all tests were computed in each MOS sample, and MOS judged similar in job demands and showing similar test validity patterns were combined. For each MOS group, a sequence of test selections was performed to determine which tests contributed significantly to validity. These statistical analyses resulted in a test battery of 16 measures and the formulation of nine aptitude areas designated as selectors for nine MOS groups. Each aptitude area consists of from three to five tests, each test being unit weighted. Finally, through simulation runs, estimates were made of operational effects of introducing the new classification system.

Findings:

Mean validity coefficient for the new ACB is .65, compared to .55 for the prior battery. A 20 percent reduction in attrition in advanced individual training estimated as a result of the higher validity.

In the simulation runs, overall level of predicted training performance was considerably higher with the new system. Taking 100 as base score representing expected performance under random assignment, mean predicted criterion score with the new battery was 104.6 compared to 102.6 with the old battery.

A more equitable distribution of ability across MOS groups is attained with the new battery. In all job areas, predicted performance is above average, means running from 103 to 108.

With the new system, the number of men performing at superior levels is increased by 15 percent; the number of men performing at marginal levels is decreased by 20 percent.

Because general mental ability is more strongly reflected in every aptitude area composite than in the previous composites, fewer men of marginal mental level (10-30 AFQT score) will achieve one or more aptitude area scores of 90 or above. So long as aptitude area scores enter into the screening process, more men in AFQT Category IV (10-30) will need to be examined before a specified number of men in Category IV are qualified for service. The men who do qualify under the new system can be expected to do better in training and adapt better to Army life.

Utilization of Findings:

The new Army Classification Battery and aptitude area system is proposed for implementation in Calendar Year 1972.

DEVELOPMENT AND EVALUATION OF A NEW ACB AND APTITUDE AREA SYSTEM

CONTENTS

Tables (Cont)

DEVELOPMENT AND EVALUATION OF A NEW ACB AND APTITUDE AREA SYSTEM

A new Army Classification Battery and a new aptitude area system have been developed to meet more effectively the needs of the modern Army. Since the 1958 aptitude area system was introduced operationally, technological changes have greatly increased the complexity of Army jobs. Greater competence--in some cases a different kind of competence--is required of the men who make up the Army's enlisted forces. Training programs have been redesigned to develop the competence and skills required. Some Army schools training enlisted men for assignment in Military Occupational Specialties (MOS) have asked for more comprehensive measures of trainability so that the men selected on the basis of a given aptitude area prerequisite will have greater likelihood of successfully completing the training.

To meet changing requirements, the Behavior and Systems Research Laboratory has conducted a large-scale research program to develop more appropriate classification measures. Experimental and operational tests were administered to about 25,000 men in over 100 different training courses, covering the gamut of openings available to newly enlisted men. The men came from all over the country and were representative of Army input. The sampling of men and training courses provided a solid scientific base for developing a new Army Classification Battery and aptitude system.

Experimental tests and tests of the operational Army Classification Battery (ACB) were evaluated against performance in the training courses. The first test of a recruit's ability to meet Army demands occurs in his job training course, and job training grades are the first objective assessment of how well individuals perform in their initial assignments. These initial assignments are made largely on the basis of ACB measures. For these purposes the accuracy with which training grades are predicted serves as a standard by which to evaluate the effectiveness of the classification tests.

Operational test scores and background data were obtained from official records. The experimental tests were administered to trainees in the courses as the men began their instruction. The men in each course were followed through training to obtain measures of how well they succeeded in subsequent duty assignments. Analysis of these date will be presented in a separate report.

DEVELOPMENT OF THE NEW APTITUDE AREA SYSTEM

The Experimental Tests

The experimental measures were designed to expand the test coverage of the operational ACB and to update certain of the component tests. Included were measures of interest in a number of occupational areas. New tests were tried out to extend measurement in the important domain of general mental ability. Updated versions and modifications of existing tests were included in the domains of mechanical ability and perceptual ability. The experimental tests are described in Table 1.

Each test in the experimental battery was designed to measure a set of skills, knowledge, or interests related to performance in a group of MOS. Previous developmental research had shown that the experimental test were valid for some MOS, but their differential validity for various occupational areas and the extent of their unique validity remained to be determined. The present analysis was designed to determine whether each of the tests was an accurate predictor of success in a relevant group of MOS--for example, a test of mechanical ability must be valid for mechanical maintenance MOS--and whether it makes a unique contribution to prediction--that is, has a large beta weight. It should also have its highest validity for related MOS, and lower validity for unrelated MOS. Mechanical tests, for example, should be less valid for clerical-administrative jobs than for mechanical jobs. Tests of general ability may have validity for a wide variety of jobs because successful performance in most jobs requires a significant component of general mental ability. The requirement for differential validity therefore is not so stringent for these tests.

Sampling and Data Collection

The samples on which experimental and operational test scores and background data were collected have been described in BESRL Technical Research Report 1159[1]. The MOS training courses contained some students who had had extensive Army training and job experience. The training performance of these men is probably of a different order than that of men who recently entered the Army. The samples were purified by deleting all men who were known to have had other Army job assignments. Female trainees were also dropped from the samples. The population to which the results of this research generalize is composed of males who recently entered the Army and are in their initial training program.

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[1] Maier, M.H. and E.F. Fuchs. Development of improved aptitude area composites for enlisted classification. Technical Research Report 1159, (AD 831 268) Behavior and Systems Research Laboratory, Arlington, VA. September 1969.

Table 1

DESCRIPTION OF EXPERIMENTAL TESTS

1. Subtraction and Division (100 items). The task involves simple arithmetic computations; no reading is required.

2. Tool Knowledge (20 items). The task is to identify the functions of hand tools, or to identify which tool among the alternatives is used in the same trade as the tool shown in the item. The item and alternatives are always shown in pictorial form, with the exception of the last item, which contains words in the alternatives.

3. Differential Classification Inventory. The task in one group of items is to indicate the activity the person thinks he is best at or would rather do. In other items, the respondent is to rate the quality of his performance or level of interest, or to describe his perception of himself and of others. Four scores are obtained:

Electronics Interest Scale	(20 items)
Mechanical Interest Scale	(20 items)
Clerical Interest Scale	(20 items)
General Adjustment Scale	(20 items)

4. Electronics Information (20 items). The task is to identify electrical and electronic equipment and components and to define electrical terms.

5. Mechanical Comprehension (20 items). Measures knowledge of mechanical forces, valves, gears, and pulleys.

6. Mathematics Knowledge (20 items). Measures ability in algebra, geometry, and interpretation of graphs.

7. Science (20 items). Measures ability to read electrical diagrams, identify electrical components, and explain electrical circuits.

8. Personal Inventory for Electronics. Includes items on attitudes toward authority figures, home and school background, frequency of using tools, activities engaged in,and personality items. Four items are in common. Two scores are derived:

High Skill	(25 items)
Low Skill	(25 items)

9. Pattern Analysis (20 items). The task is to identify which of four forms results from folding a pattern.

Table 1 continued

10. Science Knowledge (30 items). Measures knowledge of biology, chemistry, physiology, and medicine.

11. Electronics Pictures (20 items). The task is to identify electrical components and various symbols used in electrical diagrams.

12. Occupational Interest Inventory. Examinee indicates degree of liking for specific activities of the job and desired level of supervision and skill requirements in a job. Scores are obtained on three areas of interest:

Biological	(20 items)
Construction	(20 items)
General Job	(20 items)

The examinee also indicates whether he has had each of the following ten high school courses:

Biology	Physics
Chemistry	Earth Sciences
General Science	Algebra
Electrical Shop	Woodwork
Hygiene	Metal Work

13. Trade Information (25 items). Measures knowledge of electrical wiring, carpentry, construction equipment, hardware (as found in hardware store), and principles of design.

14. Attention-to-Detail (60 items). The task is to count the number of C's, which varies from zero through four, in a series of O's and C's.

Only the Subtraction and Division Test and the Attention-to-Detail Test are highly speeded. All the tests are scored rights only (R) except the Subtraction and Division Test, which is scored rights minus one-fourth wrongs (R - W/4). All the tests except two involve extensive verbal comprehension. The Subtraction and Division Test contains no words. The Tool Knowledge Test consists of pictures in the items and alternatives with a few verbal statements to identify the task for a group of items.

A large proportion of the trainees, about 25%, did not graduate on schedule, and course grades for this group, if available, were of questionable meaning. The exceptional cases consisted of three main subgroups: academic failures, academic turnbacks or recycles, and withdrawals for nonacademic reasons. The withdrawals were assumed to be randomly distributed and were dropped from further consideration. The failures and turnbacks were not randomly distributed; had they been dropped, the samples would have been biased, as men with low training performance would have been deleted. An analysis was conducted to determine how to assign grades to turnbacks and failures[2]. The results indicated that the scale position of failing grades was one standard deviation below minimum passing, and all failures were assigned this grade. The scale position of grades for turnbacks was one-half a standard deviation below the mean of the graduates; turnbacks without grades were assigned that grade, and if a grade was reported for a turnback, that grade was the one used in the analysis. With the inclusion of the academic failures and turnbacks, the sample for each training course had no known source of criterion bias.

Data Analysis

Validity coefficients for all tests were computed against final course grade in each MOS training course. Product-moment intercorrelation matrices of test scores and final course grade were computed for all MOS samples. Because each sample had previously been selected on the basis of operational ACB scores, the coefficients were corrected by the multivariate restriction in range formula to reflect the results that would have been obtained for a random sample of the population of men eligible for Army service. The complete matrix of intercorrelations, corrected to population values, of all test, background, and training performance variables is shown in Table A-1 of the Appendix.

At this stage, with 100 samples and more than 30 variables, over 3,000 validity coefficients had been computed. Regression equations were computed in each sample to determine what aptitudes, knowledge, and interests were important in identifying potential for success in each MOS. The results were examined to determine MOS that had similar requirements. MOS judged similar in terms of job demands and profiles of test validity were grouped in order to obtain more reliable estimates of validity. Mean validity vectors were computed for each group of MOS with the MOS samples unit-weighted rather than weighted by number of cases in each sample. Test selections were performed on the mean validity vectors to determine which tests had unique validity for each group of MOS. Finally, simulation runs were made to obtain estimates of the impact on training performance to be expected from the new classification system and to obtain estimates of the distributions of aptitude area scores at different AFQT levels.

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[2] Maier, M.H. Procedures for assigning grades to failures and turnbacks in Army school courses, Technical Research Note 197. (AD 835 582). Behavior and Systems Research Laboratory, Arlington, VA. April 1968.

Grouping the MOS

A major problem was to find a reasonable basis for grouping the MOS into homogeneous clusters. About 90 different MOS were included in the over 100 samples obtained at the training schools. Several hundred MOS are potentially available to a recruit entering the Army. Because of quota restrictions, not all MOS are open at any one time. Even so, the number of possibilities is too great for the human mind to consider simultaneously. Besides, most of the MOS fall into homogeneous clusters involving similar job tasks. Rational procedures were required to find ways of reducing the complexity. Two considerations for combining MOS into meaningful groups were empirical data and operational convenience. Any grouping should combine only those MOS that are similar in the aptitudes and interests required for successful completion of training. Operational convenience required that the official Army MOS structure be followed so far as possible consistent with the research findings.

Since the mid 1950's, Army MOS have been grouped into ten occupational areas based on similar job functions--mechanical maintenance, for example. The aptitude area system was generally tied into the occupational area structure. The MOS samples in the present research were also grouped by occupational area, and the mean validity vectors were computed for each area. The standard deviation of the validity coefficients for each test in each MOS group was also computed. The results are shown in Table B-1 of the Appendix. An alternative grouping of MOS was by Career Management Fields (CMF), which were being considered for operational implementation in the early 1970's. The CMF are smaller groupings of MOS, each CMF being a set of closely related jobs. Many of the 39 CMF are expected to require similar aptitudes, knowledge, and interests. Mean validity vectors and standard deviations of validity coefficients for each CMF for which data were available were computed (Table B-2).

Each CMF was found to be relatively homogeneous, with two notable exceptions--the Field Artillery-Missiles CMF and the Air Defense CMF, both of which included electronics repair and crewman MOS. In these fields, different tests were found to be valid for the repairmen and the crewmen. For classification purposed, therefore, the repair and crewman MOS in these fields were analyzed separately.

In computing the validity vectors, each MOS sample was unit-weighted. In the case of some MOS for which large numbers of men are trained, such as Infantry, there were samples from several different training installations. Since the sample from each installation was unit-weighted, MOS with more trainees were in effect multiple weighted. The validity coefficients were not converted to z coefficients prior to averaging. Some mean vectors were based on only a few samples (only two in the Field Cannon and Rocket Artillery composite). Others were based on many samples (20 in the Electronics Repair composite). Each vector was considered to be the best estimate of the validity of the tests for a given group of MOS.

Comparison of the means and standard deviations for occupational areas and career fields indicated that the CMF were generally more homogeneous. Since the expection was that the CMF--or similar groupings--would be used operationally for grouping MOS, the decision was made to base the aptitude area classification system on the CMF structure. Similar CMF were combined, and the combinations are hereafter referred to as MOS groups.

The next step was to simplify the system by reducing the number of MOS groupings and the number of tests. Test selections were performed on the mean validity vector for each CMF, using the forward test selection technique developed by Summerfield and Lubin[3]. CMF for which similar tests were selected by this technique were combined. Tests not selected for any CMF were dropped. The cycle of combining CMF and dropping tests was repeated several times.

Before starting with the test selections, three tests that were operational in the old ACB were deleted from the analysis. The Pattern Analysis Test was dropped because the items were interdependent, several referring to the same diagram. The Electronics Information Test was deleted because many items were outdated. The Shop Mechanics Test was deleted because the ACB version and the Army Qualification Battery (AQB) were not parallel. (The AQB is used at Armed Forces Entrance and Examining Stations to determine eligibility for service for men in mental Category IV and for enlisted commitment.) For each of these tests, an experimental test that was equally valid--or more valid--was available and was substituted for the deleted test in the test selection and evaluation procedure for the new ACB.

The first test selection included 28 tests and 25 CMF. The results are shown in Table B-3. This selection could not be completed on four CMF because the multiple correlation coefficients were greater than unity[4].

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[3] Summerfield, A. and A. Lubin. A square root method of selecting a minimum set of variables in multiple regression. Psychometrika, 1951, 16, 271-284.

[4] The multiple correlation coefficients greater than unity reflects some of the problems in conducting research in an operational setting. Multiple correlation coefficients greater than one are an impossibility if the data are complete for all cases in the sample. In the Army operational setting, however, obtaining complete data on all cases is extremely difficult. Usually, in fact, a large percentage of cases have missing scores on one or more variables. Ideally, cases with missing data would be dropped from the sample when computing the multiple correlation coefficients. However, the sample size is often barely adequate when all cases are included, and to drop cases with missing data would frequently result in inadequate samples. The researcher is faced with the dilemma of including all cases, even those with missing data, a step which means that each statistic is based on the maximum number of cases, or of dropping cases with missing data, a step which satisfies the canons of statistical rigor. If all cases are included, the statistics may in some cases be inconsistent with one another because they are based on different individuals and the reduction in numbers is not on a random basis. Dropping cases with missing data has the drawback that any statistics based on a substantially reduced number of cases have larger standard errors, especially the beta weights computed in multiple regression.

These CMF were grouped with other CMF in the next test selection on the basis of similarity of validity vectors. Weights for five tests are reported because it was found that this number produced a multiple correlation coefficient about equal to that for the full set of tests. Nine tests were dropped after the first set of test selections because they were relatively unimportant or because they appeared in equations for CMF where they were not reasonable.

An expectation based on the experimental tests was that Electronics Repair MOS could be separated from the Electrical-Mechanical Maintenance MOS. The Electronics Picture Test and Personal Inventory for Electronics (high and low level keys) were designed to make this differentiation. Another expectation was that the Medical MOS could be differentiated from the other General Technical MOS such as Intelligence and Topography. The Bio-Chemical Information Test was designed especially to select men for Medical MOS. Results did not support use of these tests to make the desired discriminations. The Electronics Picture Test and Personal Inventory for Electronics were therefore dropped after the first round of test selections because they had little valid variance. The Bio-Chem Test was valid for Medical MOS, but also for Construction, Chemical, Administrative, and Information/Audio-Visual MOS. The Electronics and Electrical Repair and Medical MOS were kept separate in the hope that with fewer variables, a clearer picture of the uniquely valid tests for these MOS would emerge. The Crewman and Electronics Repairman MOS in Field Artillery-Missiles and Air Defense CMF were separated to determine if separate equations were appropriate for these two job groups. The net outcome left 19 tests and 19 MOS groupings for the second round of test selection.

The first five tests selected in the second round of test selections for each cluster of MOS and their beta weights are shown in Table B-4. The results were used to pool clusters that had similar composites of valid tests. Infantry-Armor and Combat Engineer MOS were similar. Electronics and Electrical/Mechanical MOS also had similar composites. Missiles and Air Defense operators, however, were distinctly different from Electronics Repairmen. Clerical, Administrative Finance, and Supply MOS were close enough to suggest that they too could be pooled. Mechanical and Aircraft Maintenance MOS were also similar, as were Combat Surveillance and Communications Operations. Another grouping that emerged from the data was a combination of Motor Transport, Missile Operators, and Food Service MOS.

A third and final round of test selections was conducted on these new groupings of MOS to determine whether the MOS could be further combined. The results of the test selection are shown in Table B-5. Two tests, the Subtraction and Division Test and the Science Test, were deleted from the battery because they had little unique validity. A third test, Tools, was dropped. Since it appeared for only one CMF--Field Cannon and Rocket Artillery--to which only a small number of men are assigned, it was not judged sufficiently useful to include in the battery. The Field Cannon and Rocket Artillery composite would have had higher validity with the Tools Test ($r = .69$) than without ($r = .62$), but the increase was deemed worth less

than the administrative cost of including the test operationally. The MOS groupings and test composites that emerged from this analysis were consistent with prior information about job families and test validity, and no further search for different combinations of MOS or tests was considered necessary.

Nine MOS groups could be differentiated on the basis of the tests in the new ACB (Table 2). The new MOS groups are generally similar to those in the old system. Infantry, previously a separate group, was combined with Armor and Combat Engineering to form a Combat group. The position of Missiles Crewmen in the occupational structure has always presented a problem. In the old system, they were part of a heterogeneous group called AE for Armor, Artillery, and Engineering. In the new system, Armor and Engineering were combined with Infantry, as already noted, and the Missiles Crewmen were found to require the same test composite as Motor Vehicle Drivers and Food Services. The latter three MOS were combined to form the OF group. OF has no counterpart in the prior system. All the Electronics and Electrical Repair MOS were combined in the EL group, even though special efforts were made to separate the more complex electronics repair MOS from the more mechanically oriented electrical repair MOS; the EL groups in the old and new systems are virtually identical.

The SC (Surveillance and Communications) group has no counterpart in the old system. SC combines radio operator MOS, which formed the old RC group, communications center operator, MOS which were in the clerical group, and combat surveillance and target acquisition MOS from the old AE area. The remaining MOS groups, Mechanical Maintenance (MM), General Maintenance (GM), Clerical (CL), and Skilled Technical (ST), are similar in the two systems. Drivers were removed from the old MM, and a few other minor changes were made. The General Technical (GT) label was changed to ST in the new system with a view to reducing the surplus meaning attaching to the GT label which has tended to be associated with IQ.

Validity of Composites

Each MOS group has associated with it a test composite that is used as prerequisite for assignment to an MOS in that group. Symbols for MOS group and associated test composite are the same.

The final grouping of the MOS, the tests retained in the new ACB, and the tests selected for each composite all interact to form the new aptitude area system. Each aspect of the system exists only in relation to other aspects. The content of the new ACB, with changes from the old ACB, is shown in Table 3. The tests are grouped in four domains: 1) general ability, which has been expanded from three to five tests; 2) mechanical ability--one test, Shop Mechanics, has been dropped and replaced by Trade Information; 3) perceptual ability--one test, Army Clerical Speed, has been replaced by Attention-to-Detail; and 4) the Self-Description Inventory, to which three new interest scales, Attentiveness, Electronics, and

Table 2

COMPOSITION OF MOS GROUPS

MOS Group	Major Jobs in Each MOS Group
CO (Combat)	Infantry, Armor, Combat Engineer
FA (Field Artillery)	Field Cannon and Rocket Artillery
EL (Electronics Repair)	Missiles Repair, Air Defense Repair, Tactical Electronic Repair, Fixed Plant Communications Repair
OF (Operators and Food)	Missiles Crewman, Air Defense Crewman, Driver, Food Services
SC (Surveillance and Communications)	Target Acquisition and Combat Surveillance, Communication Operations
MM (Mechanical Maintenance)	Mechanical and Air Maintenance, Rails
GM (General Maintenance)	Construction and Utilities, Chemical, Marine, Petroleum
CL (Clerical)	Administrative, Finance, Supply
ST (Skilled Technical)	Medical, Military Policeman, Intelligence, Data Processing, Air Control, Topography and Printing, Information and Audio Visual

Maintenance, have been added. Each of these scores was found to be a valid predictor of training success in one or more MOS groups. The validity coefficients of the new ACB tests for each MOS group are shown in Table B-6 (Part 1) and the beta weights are shown in Table B-7 (Part 1). The validity coefficients and beta weights for the tests not included in the new ACB are also shown (Part 2 of Tables B-6 and B-7, respectively).

The nine new aptitude area composites are shown in Table 4. All the composites contain at least one test of general mental ability; Arithmetic Reasoning occurs in seven composites, and other tests of general ability occur in the remaining two composites. Thus, the new composites have a heavier weighting of general mental ability than the old composites. The new composites are also more complex than the old ones. All the old composites contain two tests, while the new ones contain at least three, and five of the nine composites contain five tests. The operational significance of the changes in the composites is discussed in the BESRL Technical Research Report, TRR 1177, An Improved Differential Army Classification System[5].

An additional composite, GT (also shown in Table 4), is composed of Arithmetic Reasoning and Word Knowledge. In the old system the GT score served a dual function of selecting persons for the GT MOS group and determining which men were qualified to take additional tests such as the Officer Candidate Test and Flight Aptitude Selection Test. The former function is filled by the ST composite in the new system, while the latter function is retained for the GT score. Many Army regulations and testing programs are based on the GT score. Since the GT score is so widely used and accepted throughout the Army, it was retained at least temporarily in the new system.

The beta weights for all tests in the new ACB are shown in Appendix Table B-8. The tests with highest weights in the full regression equations were almost always selected for the composites.

The multiple correlation of the new ACB composites with training grades is shown in Table 5, along with the multiple correlation coefficients of the full composites of 33 variables, which include 11 operational ACB tests, 20 experimental tests, age, and years of education. The loss in validity for the shorter composites is substantial for some MOS groups, especially Field Artillery (FA). One variable that had a large beta weight in most cases was age, as shown in Table 6 and in Table B-7, which shows the regression equations for all 33 variables. Evidently, the more mature men are often better in training than their test scores

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[5] Maier, M. H., and E. F. Fuchs. An Improved Differential Army Classification System. Technical Research Report 1177, Behavior and Systems Research Laboratory, Arlington, VA. April 1972.

Table 3

CONTENT OF NEW AND PRIOR ARMY CLASSIFICATION BATTERIES

New ACB	Prior ACB	Change
<u>General Ability Tests</u>		
Arithmetic Reasoning (AR)	Arithmetic Reasoning (AR)	Shortened
Word Knowledge (WK)	Verbal (VE)	Shortened
General Information (GI)	General Information (GIT)	Updated and shortened
Mathematics Knowledge (MK)		Added
Science Knowledge (SK)		Added
<u>Mechanical Ability Tests</u>		
Electronics Information (EI)	Electronics Information (ELI)	Updated
Mechanical Comprehension (MC)	Mechanical Aptitude (MA)	Updated
Automotive Information (AI)	Automotive Information (AI)	Shortened
Trade Information (TI)		Added
	Shop Mechanics (SM)	Dropped
<u>Perceptual Ability Tests</u>		
Pattern Analysis (PA)	Pattern Analysis (PA)	Updated
Auditory Perception (AP)	Army Radio Code Aptitude (ARC)	none
	Army Clerical Speed (ACS)	Dropped
Attention-to-Detail (AD)		Added
<u>Classification Inventory</u>		Enlarged
Combat Scale (CC)	Classification Inventory (CI)	Updated and shortened
Attentiveness Scale (CA)		Added
Electronics Scale (CE)		Added
Maintenance Scale (CM)		Added

Table 4

NEW APTITUDE AREA COMPOSITES

Test		Aptitude Area Composites									
General Ability Tests		CO	FA	EL	OF	SC	MM	GM	CL	ST	GT*
Arithmetic Reasoning	(AR)	AR	AR	AR		AR		AR	AR	AR	AR
General Information	(GI)		GI		GI						
Mathematics Knowledge	(MK)		MK				MK			MK	
Word Knowledge	(WK)					WK			WK		WK
Science Knowledge	(SK)							SK		SK	
Mechanical Ability Tests											
Trade Information	(TI)	TI		TI			TI				
Electronics Information	(EI)		EI	EI			EI				
Mechanical Comprehension	(MC)			MC		MC		MC			
Automotive Information	(AI)				AI		AI	AI			
Perceptual Ability											
Pattern Analysis	(PA)	PA				PA					
Attention-to-Detail	(AD)	AD							AD		
Auditory Perception	(AP)					AP					
Self Description											
Combat Scale	(CC)	CC									
Attentiveness Scale	(CA)		CA		CA				CA		
Electronics Scale	(CE)			CE							
Maintenance Scale	(CM)						CM				

Legend: Aptitude Area Composites

CO=Combat	SC=Surveillance and Communications
FA=Field Artillery	MM=Mechanical Maintenance
EL=Electronics	GM=General Maintenance
OF=Operator and Food	CL=Clerical
GT=General Technical	ST=Skilled Technical

* GT used only to determine who is qualified to take additional tests such as the Officer Candidate Test.

indicate. Age was not included in the new composites because its use in selection and classification has broad implications, and a thorough policy review would be required if it were to be used operationally.

Validity of Education, Age, and Selected High School Courses

For some Army training courses, completion of a certain academic course is prerequisite. For example, high school algebra is required for admission to the Field Artillery Operations and Intelligence Assistant Course. The present research provided opportunity to determine empirically any unique predictive validity associated with completion of selected high school courses.

As part of the experimental testing, examinees were asked to state whether they had taken certain high school courses: biology, chemistry, general science, electrical shop, hygiene, physics, earth science, algebra, woodworking, and metalworking. The yes-no responses were correlated with final course grades in each sample and beta weights computed. Years of education and age, obtained from official records, were also included in the validity analysis. The regression equations included--in addition to ten high school courses, age, and education--scores on the Arithmetic Reasoning and Automotive Information tests of the ACB and three interest scales from the Classification Inventory--Electronics, Maintenance, and Attentiveness.

The mean beta weights indicated little unique validity for the courses, most coefficients being near zero (Table C-1). Although the validity coefficients for completion of the courses were positive, the beta weights were usually small, and about half were negative. Level of education or years of schooling completed was a valid predictor of training performance in most MOS groups. In previous research[5], it was found that level of education contributes to the validity of the ACB for selected groups of MOS. In the present research, level of education was found to be uniquely valid when both selected ACB tests and specific courses were included in the regression equations, as indicated by the high weights in Table 6. The positive weights mean that men with lower levels of education such as high school dropouts and younger men do less well in MOS training than their test scores indicate, while men with more education such as college graduates and older men do better in MOS training than would be expected from their test scores.

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[5] Maier, M.H. Effects of educational level on prediction of training success with the ACB. Technical Research Note 225. Behavior and Systems Research Laboratory. Arlington, VA. January 1971.

Table 5

VALIDITY OF NEW ACB COMPOSITES

MOS Group	Validity Coefficient of Composite	Maximum Validity Coefficient (33 variables)
CO (Combat	.53	.57
FA (Field Artillery)	.61	.74
EL (Electronics Repair)	.73	.76
OF (Operators and Food)	.45	.50
SC (Surveillance and Communications)	.69	.74
MM (Mechanical Maintenance)	.74	.80
GM (General Maintenance)	.68	.73
CL (Clerical)	.68	.75
ST (Skilled Technical)	.69	.78
Mean	.65	.71

Table 6

MEAN BETA WEIGHTS OF LEVEL OF EDUCATION, AGE, AND ARITHMETIC REASONING

(Weights abstracted from Table C-1)

MOS Group	Level of Education	Age	Arithmetic Reasoning
CO (Combat)	.01	.06	.20
FA (Field Artillery)	.23	.11	.23
EL (Electronics Repair)	.07	.09	.18
OF (Operators and Food)	.06	.10	.03
SC (Surveillance and Communications)	.06	.03	.19
MM (Mechanical Maintenance)	.07	.18	.13
GM (General Maintenance)	.10	.16	.21
CL (Clerical)	.18	.05	.20
ST (Skilled Technical)	.17	.00	.17

EVALUATION OF THE NEW APTITUDE AREA SYSTEM

Reduction of Attrition

A major objective in developing a new aptitude area structure was to reduce attrition from Army training schools. The Taylor-Russell Tables[7] were used to estimate the effect of the new system on failure rates. The average validity coefficient across MOS groups increased from .55 under the previous battery to .65 under the new. Assuming that 80 percent of an unselected group would successfully complete the typical Army training course and that 40 percent of the input is excluded from the typical course, then the failure rate, according to the Taylor-Russell Tables, is 9 percent. The observed failure rate of all Army trainees during calendar year 1969 was 8.5 percent; the assumptions therefore appear reasonable. With an increase in the average validity coefficient to .65, and making the same assumptions, the expected failure rate would be reduced to 7 percent, or by about 20 percent.

The model on which the Taylor-Russell Tables are built assumes a single predictor and a single criterion. The Army's differential classification system uses multiple predictors and criteria. The univariate model is not entirely appropriate, but can serve as a convenient guide to estimate effectiveness. A more appropriate model for estimating predictive effectiveness is based on computerized simulation of an input population and differential classification[8]. Such a model was employed, and the results supported those found for the simple univariate approximation.

Simulated Evaluation of Performance

In the simulation runs, vectors of normal random deviates were generated and transformed by the ACB population convariance matrix to resemble scores from the Army enlisted population. Each vector represented the operational and experimental ACB scores of a randomly selected individual, plus level of education and age. Aptitude area scores were computed for each simulated individual or entity, and the entity was then assigned to a job opening. Allocation to job areas was done in such a way as to maximize the predicted criterion scores summed across all entities and job areas. Each job area was assigned a quota that equaled recent operational Army input to the job area. Thirty samples of 500 entities were

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[7] Taylor, H.C. and J.J. Russell. The relationship of validity coefficients to the practical effectiveness of tests in selection--discussion and tables. Journal of Applied Psychology, 1939, 23, 565-578.

[8] Niehl, Elizabeth and R.C. Sorenson. SIMPO-I entity model for determining the qualitative input of personnel policies. Technical Research Note 193. (AD 831 268). Behavior and Systems Research Laboratory. Arlington, VA. January 1968.

generated. The quotas are shown in Table D-1.

After the entities were assigned to the MOS groups, their expected performance was evaluated by computing predicted criterion scores using all 33 variables in the prediction equations. The mean predicted performance score was computed for each MOS group for the entities allocated to the area. This figure, called the allocation average, shows how much gain or loss in predicted performance was realized by allocating the men to jobs on the basis of aptitude area composites.

The statistics required to perform the simulation are presented in the Appendixes. Table A-1 presents the intercorrelation matrix of operational and experimental variables used to transform the normal deviates. Table D-1 presents the quotas for each MOS group. Table D-2 presents the beta weights of the 33 variables for each MOS group in the new system. The beta weights were used to obtain predicted criterion scores for each entity in its assigned job area.

Mean Levels of Predicted Performance. The results of the simulation runs are shown in Table 7. In the prior aptitude area system, eight aptitude area scores were computed for each entity and the entities were optimally allocated to one of eight job areas. Mean predicted criterion scores were obtained in each sample of 500 entities. The same entities were also allocated to one of nine job areas on the basis of the new aptitude area composites. Predicted criterion scores in the area of assignment were also computed from the regression equation of all 33 variables for that area. The mean predicted criterion scores were calculated for each job area under each assignment system. An overall mean across job areas was also computed. The values shown in Table 7 are the mean predicted criterion scores under the two aptitude area systems.

The overall level of predicted performance was considerably higher under the new system, 104.6 for the new versus 102.6 for the previous system. If the men were assigned at random, without any prior knowledge of their skills and aptitudes, the average predicted performance would be 100. When aptitude scores are used in making assignments, the predicted peformance is, of course, increased. The amount of increase is a complex function of several factors, including quotas (percentage of men assigned to each MOS group), number of MOS groups, and validity of the aptitude area scores[9]. The major source of the increase--4.6 points with the new system compared to 2.6 with the prior system--is undoubtedly the higher validity of the new composites, since the number of job areas was about the same, 9 versus 8, and the quotas in the job areas were of generally the same order.

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[9] Brogden, H.E. Efficiency and classification as a function of number of jobs, percent rejected, and the validity and intercorrelation of job performance estimates. Educational and Psychological Measurement, 1959, 19, 181 - 190.

Table 7

MEAN PREDICTED CRITERION SCORES UNDER THE NEW APTITUDE AREA SYSTEM AND UNDER THE PREVIOUS SYSTEM

Old Aptitude Area System		New Aptitude Area System	
MOS Group	Mean	MOS Group	Mean
IN	100.0	CO	103.1
AE	99.7	FA	106.3
EL	103.9	EL	106.5
GM	98.3	OF	103.5
MM	102.1	SC	107.7
CL	101.6	MM	105.5
GT	109.0	GM	107.1
RC	112.4	CL	103.6
		ST	103.7
Total	102.6	Total	104.6

Two of the MOS groups in the prior system, AE and GM, had mean predicted performance slightly below 100 (Table 7). The entities assigned to these two job groups were below average when all the information available about them contained in the 33 variables was taken into account. Two other areas, GT and RC, were substantially higher than the others. In the new system, all MOS groups had means above average, and all means were clustered from 103 to just under 108. Thus, the distribution of talent was more equitable across all MOS groups than it has been heretofore.

Gain from the New System. The absolute value of the increase in predicted performance cannot be interpreted directly because there is no score scale that can be readily applied to the mean values. However, the means can be interpreted relative to one another. The increase of 4.6

points over random assignment attained with the new system represents a 75 percent improvement over the 2.6 points increase under the prior system. It can then be said that the utility of the Army personnel classification and assignment system is increased 75 percent by converting to the new system.

The overall level of performance would be higher under the new system. Since the ACB is used to predict training success, the improved level of training performance can serve as a standard by which to evaluate the new ACB. In 1970, the median cost of putting a qualified worker in the field was about $6,000, which includes the cost of procurement, basic combat training, and job training. A reasonable estimate for the combined cost of getting a man into the Army and putting him through basic combat training is about $2,000. This leaves about $4,000 as the median cost of providing job training to produce a worker qualified in an MOS. On the average, this approach seems reasonable, although individual cases vary widely around the average. The average man performs at a level that is worth as much as he costs to train; the below-average performer represents a net loss to the Army, since he performs at a level worth less than the cost of training him. The above-average men, following the same argument, is worth more than his training cost, and the Army gains.

One way of measuring the worth of performance is to use the Army standard scale and the training cost as a basis. On the Army standard score scale, the average level of performance is set at 100. The unsatisfactory man is defined as one with an expected performance at the level of 80. Expected performance from 80 to 100 covers the range from no net worth to an equal balance between cost and performance. Since 80 represents a total net loss, and the median training cost is $4,000, the man with an expected performance of 80 is a loss of $4,000 to the Army. As the scale of expected performance is ascended, the increased performance begins to offset the training cost until cost and performance are balanced at the average level of 100. Assuming a linear increase, each point increase between 80 and 100 worth $4,000 divided by 20, or $200.

The scale also extends to the positive side. Each point of the increased expected performance on the above-average side is also worth $200. With the old ACB, the average expected performance was 2.5 points above what would be realized if the men were assigned on a chance basis, which assumes no knowledge of capability to perform. This gain means that the Army has been getting an extra $500 worth of performance (2.5 points gain times $200 for each point) per enlisted man because of the improved assignments. The new ACB and aptitude area system will add an additional 2 points to the average expected performance, or $400 more per man [illegible] the average above the gain already realized by the old system. At a tra[illegible] input rate of 200,000 men per year, the gain of the new ACB over the old assumes rather large proportions. With the new ACB, the increased worth of training performance is $400 per man; with 200,000 men, the Army each year would be getting $80,000,000 increased worth of performance from enlisted men during their training assignment.

The $80,000,000 worth of increased performance is a net gain that can be realized by implementing the new ACB and aptitude area system. The increased performance will not result in an immediate corresponding reduction in the Army budget. It does mean, however, that for a fixed number of enlisted men, the overall quality of performance will be higher. As the Army manpower strength is reduced, each position becomes more important and the quality of each man's performance more critical.

Another way of looking at the increased productivity under the new system is that the number of superior performers would be increased by 15 percent and the number of marginal performers reduced by 20 percent. A superior performer is defined as an individual with predicted criterion performance of 110 or better on the Army standard score scale, and a marginal performer as one with predicted criterion performance of 90 or below. Table 8 presents the number of men expected to be marginal or superior performers under the two systems. The numbers are based on an input of 200,000 men.

The gains in performance expected from the new aptitude area system would be realized through improved assignments, and not through higher

Table 8

EXPECTED PERFORMANCE IN OLD AND NEW APTITUDE AREA SYSTEMS

(Based on input of 200,000 men)

Aptitude Area System	Marginal Performers	Superior Performers
Old	35,000	57,500
New	27,500	67,500
	20% decrease	15% increase

selection standards. In the simulation runs, exactly the same entities were assigned under each aptitude area system and their predicted performance was evaluated by the same set of variables (that is, all 33 predictors). The new composites are better measures of potential, and their operational use will result in fewer errors in assignment.

<u>Weighting Tests in the Aptitude Area Composites</u>. The simulation runs were also used to settle the question of the weights to assign the tests in each composite. From an operational point of view, the most desirable procedure is the simple addition of all tests in a composite. Maximum validity, however, is obtained when beta weights are used.

Several weighting schemes were evaluated to determine the loss in mean predicted performance when progressively simpler systems are used. The most effective system used the maximum amount of valid information about each individual in making assignments[10]. Collecting and utilizing the information is expensive, however, and a tradeoff must be reached between cost of collecting and using information and its incremental utility. Costs and utility at the present state-of-the-art are best evaluated by expert judgment. Simulation runs can provide data on which to base judgments.

The allocation averages for the different weighting schemes are presented in Table [illegible]. The most valid, but most cumbersome scheme, was to use all 33 variables in each composite--the 11 operational tests, the 20 experimental tests, plus age and education. When the entities were assigned and evaluated by the full regression equations, the maximum allocation average, 107.5, was obtained. However, such a complex weighting scheme would be too difficult to be used routinely in the field. One simplification was to drop 15 tests that did not emerge in the test selections, as well as age and education--variables which were in effect assigned weights of zero in the assignment process. The beta weights for the remaining 16 tests were used in computing the composite scores. For this weighting scheme, the allocation average was about 105.9, a drop of 1.6 points below the maximum.

The composites were further simplified through test selection to the test content presented in Table 4. The question of what weights to assign the component tests remained. Three options were evaluated: 1) weights closely approximating the beta weights obtained in test selection; 2) simple weights of 1, 2, or 3, roughly approximating the beta weights; and 3) unit weights, for which the size of the beta weights was not considered. The three allocation averages were virtually the same: 104.63, 104.64, and 104.55, respectively. The simplified composite resulted in a drop in the allocation average from 105.9 for the full beta-weighted composites

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[10] Soreson, R.C. Optimal allocation of enlisted men--full regression equations vs aptitude area scores. Technical Research Note 163. (AD [illegible]). Behavior and Systems Research Laboratory, Arlington, VA. November [illegible].

Table 9

MEAN PREDICTED CRITERION SCORES WITH ASSIGNMENTS MADE BY DIFFERENT WEIGHTING SCHEMES

Weighting Scheme	Mean Score
Beta weights, 33 variables	107.46
Beta weights, 16 variables (New ACB)	105.87
Complex weights, New Composites	104.63
Simple weights, New Composites	104.64
Unit weights, New Composites	104.55

of 16 variables to about 104.6 for the unit-weighted composites of 3 to 5 tests each. The operational convenience of using a reduced number of variables in each composite was judged worth the loss of increased productivity that would result from the full equations. The more complex composites would be more difficult to compute--and also more difficult to interpret. For this reason, their use might be resisted by some operating personnel. The decision was to propose for operational use the simplest composites, inasmuch as the procedure did not reduce the allocation average below an acceptable level.

Selection of Men with Marginal Mental Ability

An important operational concern about the new composites is their effect on the selection of marginal men. Marginal men are defined as those having percentile scores 10 through 30 on the Armed Forces Qualification Test (AFQT), a test of general mental ability used for mental screening. Two factors are used to determine mental qualification of marginal men: level of education and number of aptitude area scores at or above 90. Under mental standards of the late 1960's, non-high school graduates who scored 10-15 on the AFQT had to have two aptitude area scores of 90 or better; nongraduates who scored 16-30 had to have one aptitude area score of 90 or better. Nongraduates who scored 10 or above on the AFQT but failed to meet the aptitude area requirements were

placed in Trainability Limited Category 1-Y. All high school graduates who scored 10 or above were mentally qualified for Army service. The aptitude area scores used to determine mental qualifications were based on the Army Qualification Battery (AQB), a series of short test corresponding to tests of the Army Classification Battery and administered at Armed Forces Entrance and Examining Stations.

The new composites are more difficult than the prior composites in that more marginal men fail to get qualifying aptitude area scores of 90. The new composites have a heavier weight of general mental ability than the previous composites, and they contain more tests in each composite, three to five instead of two. These two conditions mean that some inductees who under the old system met the mental standards then in effect would fail to do so under the new[11].

To find what effect the new composites would have on the distribution of aptitude area scores among the men given preinduction examinations, additional simulation studies were conducted. Simulation runs were made separately for each AFQT decile beginning at 21-30 and going through 91-99 and for the AFQT score ranges 10-15 and 16-20. Since the aptitude area scores used for mental qualification are based on the AQB, the AQB variance-covariance matrix and AQB composites were used. The AQB variance-covariance is presented in Table D-3. To obtain estimates of how the proportion of qualified men differs under the old and new systems, both sets of scores were generated for all men. Level of education was also included in the simulation runs. Based on other data available in BESRL, the proportion of high school graduates in a representative input group was about .75, which converts to a standard normal deviate of about .7. When the normal deviates were transformed to have means of 100 and standard deviations of 20, all entities with education scores above 86 were called high school graduates, and those with education scores of 86 and below were called nongraduates. Separate counts of aptitude area scores at or above 90 were obtained for graduates and nongraduates.

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[11] One reason more men of low general mental ability are unqualified under the new system is that more tests are included in each composite. The prior system tended to capitalize on the men's two highest scores to determine qualification. The rest of the test scores have been ignored. In computing the new composites, these lower scores are included, and the effect is to decrease the highest composite scores. Many men would therefore be shifted from the qualified to the unqualified category. A second reason for lowered scores is that the Arithmetic Reasoning Test (AR) is part of most of the new composites. Since AR has one of the highest coefficients of correlation with AFQT of any of the AQB tests, men with low AFQT scores would tend to have lower scores on AR than on other tests.

The population variance-covariance matrix of aptitude area composites, years of education, and AFQT was used to generate scores in each AFQT score level shown in Table D-4. The population matrix was restricted in range by using AFQT as the explicit selector and reducing the standard deviation of AFQT from the population value of 25.9 to 2.9 for each decile above 20, 1.4 for the 5-point range 16-20, and 1.7 for the 6-point range 10-15. The mean for each composite and education in the various AFQT score ranges was regressed by the formula:

$$\tilde{X} = \bar{X} + b\,(A-50)$$

where A = midpoint of AFQT score interval

50 = AFQT population mean

b = regression weight for predicting variable X from AFQT

$\bar{X}$ = population mean of variable

The same entities were generated for each AFQT score range, except that the mean scores changed; the variance-covariance matrices remained identical except for different degrees of restriction on AFQT.

Nongraduates have had to attain qualifying scores on one or two AQB composites, not including RC (Radio Code). The Army Radio Code Aptitude Test, called Auditory Perception in the new ACB, has not been part of the Army Qualification Battery and is not expected to be included in the AQB under the new system. The SC (Surveillance and Communications) composite in the new system and the RC (Radio Code) composite in the prior system were omitted from the present simulations, since the radio code test score enters into both composites.

The distribution of number of aptitude area scores at or above 90 achieved by marginal men is shown in Table 10. From these data, estimates of the increased number of nongraduates who fail to qualify on the AQB composites can be obtained. Some entities that have no aptitude area scores of 90 or better under the new system had one, two, or even three scores of 90 or better under the prior system. The converse was not true: An entity who had no aptitude area score of 90 under the old system usually has no 90 scores under the new system.

The distribution of aptitude area scores presented in Table 10 is based on AQB composites. The distribution of aptitude area scores of 90 or better for the entire AFQT range of 10 and above is shown in Table 11. Most men with AFQT scores above 30 can be expected to qualify on at least one aptitude area, and usually on more than one, although 14 percent of nongraduates in AFQT range 31-40 do not have any aptitude area scores of 90. Men with no scores of 90 or better are considered unqualified for almost all Army MOS training courses. As a rule, special consideration must be given them in making assignments.

Table 10

DISTRIBUTION OF NUMBER OF AQB APTITUDE AREA SCORES
AT OR ABOVE 90 FOR MEN IN MENTAL CATEGORY IV

AFQT Score	New Aptitude Area System		High School Graduates: Old Aptitude Area System					Non-High School Graduates: Old Aptitude Area System						Combined: Old Aptitude Area System					
10-15			0[1]	1	2	3+	Total		0	1	2	3+	Total		0	1	2	3+	Total
	New[2]	0[1]	10[3]	12	7	4	32	0	20	18	9	5	52	0	14	15	8	4	41
	Aptitude	1	3	6	5	5	18	1	3	5	5	6	19	1	3	5	5	6	19
	Area	2	1	3	4	6	13	2	1	2	3	6	13	2	1	2	4	6	13
	System	3+	1	4	8	24	37	3+	0	2	3	11	16	3+	1	3	6	17	27
		Total	14	24	23	39	100	Total	24	27	21	28	100	Total	19	26	22	33	100
16-20			0	1	2	3+	Total		0	1	2	3+	Total		0	1	2	3+	Total
	New	0	5	9	6	4	24	0	13	15	10	6	44	0	8	11	7	5	32
	Aptitude	1	2	4	4	6	16	1	2	4	5	6	17	1	2	4	5	6	17
	Area	2	1	2	3	6	13	2	1	2	4	7	14	2	1	2	3	7	13
	System	3+	1	3	9	35	47	3+	1	2	4	19	25	3+	1	3	7	27	38
		Total	8	19	22	51	100	Total	16	23	22	39	100	Total	11	21	22	45	100
21-30			0	1	2	3+	Total		0	1	2	3+	Total		0	1	2	3+	Total
	New	0	2	4	4	4	13	0	6	9	7	7	28	0	3	6	5	5	19
	Aptitude	1	1	2	3	5	12	1	1	3	5	8	17	1	1	3	4	6	14
	Area	2	0	2	3	6	11	2	1	2	3	9	15	2	0	2	3	7	12
		3+	0	2	8	55	64	3+	0	2	5	33	40	3+	0	2	6	47	55
		Total	3	10	17	70	100	Total	8	16	20	56	100	Total	5	12	18	64	100

Note [1]Row and column headings refer to number of scores at or above 90. 3+ includes all numbers of 3 and above.
[2]Army Qualification Battery (AQB) composites used in computations.
[3]Cell entries are percentages

Table 11

DISTRIBUTION OF NUMBER OF NEW APTITUDE AREA SCORES AT OR ABOVE 90 FOR FULL RANGE OF MENTAL ABILITY

	Non-High School Graduates Number of Aptitude Area Scores at or above 90									% of Non-grads in AFQT score	High School Graduates Number of Aptitude Area Scores at or above 90									% of Grads in AFQT score	Total Number of Aptitude Area Scores at or above 90								
AFQT Score[1]	0	1	2	3	4	5	6	7	8		0	1	2	3	4	5	6	7	8		0	1	2	3	4	5	6	7	8
10-15	52[2]	19	13	6	5	3	1	1	0	45	32[2]	18	13	11	9	7	5	3	1	55	41[2]	19	13	9	7	5	3	2	1
16-20	44	17	14	10	6	5	2	2	1	40	24	16	13	11	11	9	7	6	3	60	32	17	13	11	9	7	5	4	2
21-30	28	17	15	12	9	7	5	4	3	36	13	12	11	12	12	11	11	10	9	64	19	14	12	12	11	10	9	8	7
31-40	14	14	12	13	12	10	9	9	7	30	4	6	7	9	9	12	14	16	23	70	7	8	9	10	10	11	12	14	19
41-50	5	7	9	10	11	12	14	14	17	25	1	2	4	5	6	9	12	19	41	75	2	4	5	6	7	10	13	17	35
51-60	2	2	5	7	8	11	15	18	32	20	0	1	1	2	4	6	9	18	60	80	1	1	2	3	4	7	10	18	54
61-70	1	1	2	3	5	8	11	21	49	16	0	0	0	1	1	3	5	13	76	84	0	0	1	1	2	4	6	14	72
71-80	0	0	1	1	2	4	8	19	66	13	0	0	0	0	0	1	2	9	87	87	0	0	0	0	1	1	3	10	85
81-90	0	0	0	0	1	2	3	14	80	10	0	0	0	0	0	0	1	5	94	90	0	0	0	0	0	0	1	5	93
91-100	0	0	0	0	0	1	2	10	87	7	0	0	0	0	0	0	0	2	98	93	0	0	0	0	0	0	0	3	97

Note 1 ACB composites used for AFQT deciles of 31-40 and above, AQB composites used for AFQT range 10-30.

2 Cell entries show percentage of men in each AFQT score range with specified number of aptitude area scores at or above 90.

As long as aptitude area scores are used as screening standards, the increased difficulty of obtaining aptitude area scores of 90 or better has implications for personnel procurement. More men in mental Category IV would need to be examined under the new system to obtain a specified number of qualified men. The severity of the problem depends on other factors, such as quotas for men in this range of ability, educational requirements, and size of the available manpower pool. On the average, men qualifying under the new system will have higher levels of general ability and can be expected to adapt better to Army life.

CONCLUSION

In sum, the new Army Classification Battery and aptitude area system were found to be superior to the previous system. The average validity of the new aptitude area composites across all MOS is higher than that of the previous composites. Through simulation runs, the new measures were found to result in higher levels of predicted performance to be achieved by identical sample inputs. In the simulations, exactly the same men were assigned by both the old and the new ACB; the gain could therefore be realized without keeping more underqualified men out of the Army.

While the new system makes it slightly more difficult for men in the lower mental categories to achieve the one or more aptitude area scores of 90 or higher requisite to assignment to MOS training, the men who do qualify are more likely to experience success in the Army. This result is particularly important in considering a modern volunteer Army, in all probability much reduced in size. Under those conditions, it would be more critical that each space be filled by a man with high likelihood of filling it competently. Accurate assessment of aptitude at time of entry becomes even more important and mistakes in overestimating potential more costly. The new composites provide better qualified men for Army jobs because with the more accurate measurement of capabilities job assignments can be better matched to the men's aptitudes and interests.

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APPENDIXES

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APPENDIX A

Table A-1

INTERCORRELATIONS OF EXPERIMENTAL VARIABLES AND OPERATIONAL ACB TESTS
(DECIMAL POINTS OMITTED)

VAR	WK	AR	A	B	C	AP	D	AI	E	CC	GI	F	G	CE	CM	CA	H	EI	MC	MK	I	J	K	PA	SK	L	M	N	O	TI	AD	ED	AG
WK	100	68	49	54	48	47	40	34	47	39	65	48	29	27	-2	43	28	50	58	61	54	21	23	46	74	46	29	-1	43	59	29	53	19
AR	68	100	55	55	43	48	38	35	44	34	57	65	29	32	1	40	26	45	58	68	-50	25	25	53	62	44	25	4	38	53	32	47	13
A	49	55	100	56	35	41	50	37	47	31	46	34	41	28	14	20	17	43	56	50	48	26	24	68	48	49	19	11	27	49	29	30	4
B	54	55	56	100	32	41	59	56	59	35	58	32	52	28	23	18	19	52	65	50	56	32	35	54	58	56	19	15	24	63	29	33	9
C	43	48	35	32	100	42	22	14	24	27	36	52	11	21	-4	36	26	22	32	44	26	15	17	34	37	22	15	-5	29	28	41	41	9
AP	47	48	41	41	42	100	27	22	28	27	41	41	19	21	2	27	20	29	40	42	32	17	18	38	41	29	15	-0	24	35	32	34	9
D	40	38	50	59	22	27	100	63	56	31	51	17	63	20	37	6	15	45	52	34	49	32	41	42	43	51	11	21	11	60	19	21	6
AI	34	35	37	56	14	22	63	100	57	25	51	14	60	14	47	2	14	44	50	27	46	34	46	33	39	48	6	22	6	59	13	17	14
E	47	44	47	59	24	28	56	57	100	32	53	22	54	33	29	14	18	58	57	42	63	35	37	44	54	64	20	14	22	62	19	28	11
CC	39	34	31	35	27	27	31	25	32	100	41	23	24	34	23	32	37	28	36	32	32	25	35	28	39	29	30	15	30	36	22	26	5
GI	65	57	46	58	36	41	51	51	53	41	100	39	44	25	17	27	24	48	56	50	52	26	33	43	63	48	22	10	29	61	28	42	19
F	48	65	34	32	52	41	17	14	22	23	39	100	9	25	-10	38	23	26	36	56	30	15	14	36	43	23	18	-3	32	30	40	43	13
G	29	29	41	52	11	19	63	60	54	24	44	9	100	20	46	1	15	51	51	25	48	33	44	40	38	51	9	26	6	60	15	16	11
CE	27	32	28	28	21	21	20	14	33	34	25	25	20	100	21	34	27	40	34	35	42	30	27	28	33	41	48	13	45	28	20	26	10
CM	-2	1	14	23	-4	2	37	47	29	23	17	-10	46	21	100	-13	17	26	22	-3	21	32	50	13	7	26	9	40	-10	30	2	-7	-3
CA	43	40	20	18	36	27	6	2	14	32	27	38	1	34	-13	100	51	22	25	34	22	15	18	22	38	18	34	-10	52	21	24	43	19
H	28	26	17	19	26	20	15	14	18	37	24	23	15	27	17	51	100	21	23	25	21	23	32	18	27	18	19	4	30	23	19	27	10
EI	50	45	43	52	22	29	45	44	58	28	48	26	51	40	26	22	21	100	57	43	69	38	31	43	56	69	27	11	29	57	20	32	14
MC	58	58	56	65	32	40	52	50	57	36	56	36	51	34	22	25	23	57	100	56	61	34	37	58	62	59	25	15	31	64	28	38	16
MK	61	68	50	50	44	42	34	27	42	32	50	56	25	35	-3	34	25	43	56	100	56	29	24	52	62	46	26	-3	40	48	33	51	13
I	54	50	48	56	26	32	49	46	63	32	52	30	48	42	21	22	21	69	61	56	100	42	36	50	61	74	25	10	33	62	23	37	16
J	21	25	26	32	15	17	32	34	35	25	26	15	33	30	32	15	23	38	34	29	42	100	51	30	28	40	16	17	15	37	15	18	9
K	23	25	24	35	17	18	41	46	37	35	33	14	44	27	50	18	32	31	37	24	36	51	100	29	29	33	18	28	13	45	15	19	11
PA	46	53	68	54	34	38	42	33	44	28	43	36	40	29	13	22	18	43	58	52	50	30	29	100	49	50	20	11	28	50	29	31	8
SK	74	62	48	58	37	41	43	39	54	39	63	43	38	33	7	38	27	56	62	62	61	28	29	49	100	57	36	4	42	67	29	51	15
L	46	44	49	56	22	29	51	48	64	29	48	23	51	41	26	18	18	69	59	46	74	40	33	50	57	100	26	13	30	63	22	31	15
M	29	25	19	19	15	15	11	6	20	30	22	18	9	48	9	34	19	27	25	26	25	16	18	20	36	26	100	25	45	22	15	24	10
N	-1	4	11	15	-5	-0	21	22	14	15	10	-3	26	13	40	-10	4	11	15	-3	10	17	28	11	4	13	25	100	-16	19	-2	-7	-1
O	43	38	27	24	29	24	11	6	22	30	29	32	6	45	-10	52	30	29	31	40	33	15	13	28	42	30	45	-16	100	25	23	39	18
TI	59	53	49	63	28	35	60	59	62	36	61	30	60	28	30	21	23	57	64	48	62	37	45	50	67	63	22	19	25	100	24	35	18
AD	29	32	29	29	41	32	19	13	19	22	28	40	15	20	2	24	19	20	28	33	23	15	15	29	29	22	15	-2	23	24	100	31	10
ED	53	47	30	33	41	34	21	17	28	26	42	43	16	26	-7	43	27	32	38	51	37	18	19	31	51	31	24	-7	39	35	31	100	41
AG	19	13	4	9	9	9	6	14	11	5	19	13	11	10	-3	19	10	14	16	13	16	9	11	8	15	15	10	-1	18	18	10	41	100

Variable Tables

- WK Word Knowledge
- AR Arithmetic Reasoning
- A Pattern Analysis (Old)
- B Mechanical Aptitude
- C Clerical Speed
- AP Auditory Perception
- D Shop Mechanics
- AI Automotive Information
- E Electronics Information (Old)
- CC Combat Interest
- GI General Information
- F Subtraction and Division
- G Tool Knowledge
- CE Electronics Interest
- CM Mechanical Interest
- CA Attentiveness Interest
- H General Adjustment
- EI Electronics Information (New
- MC Mechanical Comprehension
- MK Mathematics Knowledge
- I Science
- J Electronics Inventory (High)
- K Electronics Inventory (Low)
- PA Pattern Analysis (New)
- SK Science Knowledge
- L Electronic Picture Test
- M Biological Interest
- N Construction Interests
- O General Job Interests
- TI Trade Information
- AD Attention to Detail
- ED Years of Education
- AG Age

APPENDIX B

Table B-1

MEAN AND STANDARD DEVIATION OF VALIDITY COEFFICIENTS FOR OCCUPATIONAL AREAS
(Decimal Points Omitted)

MOS Group	F[1]	G	CE	CM	CA	H	I	MC	MK	I	J	K	PA	SK	L	M	N	O	TI	AD	ED	AG	WK	AR	A	B	C	AI	D	AI	E	CC	GI	No. of Samples
	A. Mean Validity Coefficients																																	
IN 1[2]	33	29	16	6	25	25	27	44	37	38	17	23	41	39	33	11	1	19	43	30	27	20	36	44	41	46	25	31	38	30	36	29	30	3
AE 1	29	31	23	13	27	20	36	43	41	38	25	27	37	42	34	15	5	25	40	32	37	22	44	46	36	38	33	33	31	35	36	23	43	11
EL 2	39	42	44	10	35	24	62	63	56	59	29	24	49	60	61	29	5	44	60	36	45	30	60	62	53	54	42	44	45	40	56	36	55	8
EL 3	37	42	45	22	31	26	54	57	52	55	35	36	48	51	53	23	15	32	55	24	40	21	50	55	47	52	35	37	44	44	54	30	50	13
GM 4	43	57	29	29	28	26	55	59	52	53	32	45	55	55	53	23	19	32	63	32	44	36	54	57	52	57	35	42	53	53	53	37	56	5
GM 5	49	43	27	16	36	23	55	56	59	53	26	32	47	59	44	25	11	31	59	27	47	30	58	60	46	53	28	37	46	51	52	31	60	5
MM 6	35	48	24	32	29	27	48	54	49	56	36	44	43	52	47	15	19	23	58	19	37	19	48	50	41	51	31	36	45	54	51	31	54	19
CL 7	50	24	23	-4	40	28	39	47	56	42	17	15	39	56	36	20	4	35	45	34	50	29	63	62	42	43	43	43	29	29	37	29	51	21
GT 8	31	15	17	-9	37	19	47	56	60	47	26	7	50	57	41	14	-4	38	39	23	42	21	57	67	47	50	40	45	35	29	44	33	50	4
GT 9	37	30	25	3	30	21	42	49	50	42	20	19	41	55	39	24	12	23	48	29	41	23	54	53	41	47	39	40	35	32	40	31	50	11
RC 0	40	33	33	7	29	25	36	49	46	45	28	34	46	45	42	15	4	34	47	35	38	23	47	52	42	46	33	53	31	29	37	23	44	
	B. Standard Deviation of Validity Coefficients																																	
IN 1[2]	5	2	6	13	4	2	6	4	6	9	1	2	7	6	7	6	16	4	2	5	9	7	7	6	6	7	7	4	3	5	7	3	8	
AE 1	15	10	12	9	18	11	14	15	17	14	15	11	17	15	15	8	11	11	14	14	16	13	17	18	14	14	9	14	12	11	12	8	11	
EL 2	4	10	10	9	9	7	7	6	14	13	17	8	11	7	9	12	17	8	5	6	13	17	6	9	7	5	8	7	8	8	8	8	7	
EL 3	9	7	12	10	7	6	11	9	12	12	12	5	7	7	12	8	18	15	8	9	14	14	6	8	6	8	6	5	7	7	12	8	6	
GM 4	7	8	9	11	9	14	10	7	11	8	6	8	9	9	10	19	16	16	11	11	10	13	11	11	9	8	5	5	8	7	7	6	5	
GM 5	8	7	23	12	16	11	7	11	8	8	13	8	14	12	13	13	8	20	5	14	14	10	10	7	9	5	12	5	5	7	5	5	3	
MM 6	14	10	12	10	10	10	14	13	15	13	16	12	14	11	14	12	9	13	10	12	13	11	11	12	12	13	10	8	11	11	11	8	8	
CL 7	8	8	10	13	12	8	10	9	8	10	13	11	10	7	9	10	10	8	9	8	10	16	7	5	8	8	7	6	6	8	7	6	7	
GT 8	7	19	24	10	7	7	4	7	3	9	14	17	7	5	9	17	30	13	17	12	10	10	4	5	6	5	5	3	5	3	4	4	3	
GT 9	19	8	13	6	12	10	15	14	21	17	15	8	15	18	14	14	15	13	13	8	20	13	17	18	17	15	10	12	12	10	11	10	11	
RC 0	1	3	5	13	10	4	9	4	8	7	2	10	4	8	6	15	9	7	3	4	8	9	8	5	3	7	2	4	5	4	1	4	2	

Note [1] See Table A 1 for test titles

[2] Row Labels

1 Infantry Combat (IN)
1 Armor, Artillery Engineers-Combat (AE)
2 Missile and Fire Control Electronics Maintenance (EL)
3 General Electronics Maintenance (EL)
4 Precision Maintenance (GM)
5 Auxiliary Services (GM)
5 Motors (MM)
7 Clerical (CL)
8 Graphics (GT)
9 General Technical (GT)
0 Radio Code (RC)

Table B-2 Part 1

MEAN AND STANDARD DEVIATION OF VALIDITY COEFFICIENTS
FOR CAREER MANAGEMENT FIELDS
(Decimal points Omitted)

Career Management Field	F[1]	G	CE	CM	CA	H	EI	MC	MK	I	J	K	PA	SK	L	M	N	O	TI	AD	ED	AG	WK	AR	A	B	C	AP	D	AI	E	CC	GI	No. of Samples
A. Mean Validity Coefficients																																		
CO 1[2]	33	30	18	11	26	26	28	42	37	35	21	25	39	40	32	13	6	20	42	31	31	22	38	43	37	41	29	33	37	30	36	29	39	5
CO 2	32	31	25	18	38	32	36	37	38	35	28	36	36	48	32	17	13	29	51	34	33	13	45	47	33	38	29	36	26	33	32	22	34	1
FA 3	40	39	29	11	32	26	42	47	53	43	30	28	37	47	42	19	-4	32	43	25	54	36	49	55	41	44	39	34	28	29	39	28	45	2
4	38	22	58	5	46	27	68	68	66	73	44	30	64	63	75	44	-15	56	62	45	52	41	65	72	50	53	42	53	45	34	65	49	64	1
5	32	36	29	10	27	19	47	51	44	47	19	21	39	49	46	20	6	33	48	34	35	26	48	51	43	44	36	35	39	38	44	27	48	10
SC 6	25	33	37	7	38	18	50	61	58	49	28	25	55	55	44	24	23	35	50	26	41	25	63	67	53	52	40	50	36	39	46	28	52	4
EL 7	35	44	43	21	31	26	52	57	52	54	38	37	47	51	51	23	10	34	57	28	39	18	50	53	49	51	37	38	44	43	53	29	50	10
EL 8	40	39	51	20	31	26	61	60	56	59	32	32	52	51	59	23	21	27	51	17	46	20	53	61	45	57	33	33	44	45	58	31	51	4
MM 9	36	53	26	34	29	26	55	57	52	60	39	47	47	56	52	17	20	26	62	22	40	28	51	52	45	56	32	39	50	57	55	34	56	16
GM10	21	46	30	29	34	30	41	40	39	47	35	36	25	48	33	24	29	12	46	32	33	2	33	43	32	39	13	19	33	34	46	30	42	1
GM11	50	39	44	10	36	21	51	64	60	53	21	23	53	67	52	32	14	43	61	37	56	42	59	60	49	50	33	32	44	47	50	31	58	2
OF12	33	32	12	18	30	20	23	38	35	34	15	32	28	37	26	5	6	18	43	8	30	11	39	35	27	32	29	33	26	43	32	20	46	3
MM13	47	54	33	37	34	33	56	65	58	63	37	42	60	62	57	28	21	36	66	29	46	15	61	65	56	63	40	43	54	56	59	34	53	4
CL14	51	22	23	-10	42	28	42	46	56	43	15	11	38	58	34	22	2	38	45	33	51	35	65	62	39	42	43	43	28	29	36	29	51	9
SC15	45	31	32	4	30	26	36	49	48	43	26	29	47	48	41	19	6	35	47	33	43	26	51	55	46	46	36	48	32	31	40	26	47	5
CL16	45	22	21	-2	34	26	35	43	55	37	18	12	34	47	34	10	1	27	44	31	45	10	55	60	37	39	40	40	27	23	33	25	44	3
ST17	57	31	44	-9	60	32	47	59	70	55	5	18	57	62	52	28	15	44	58	34	56	23	73	75	53	62	51	47	39	35	46	37	61	1
CL18	52	27	17	7	43	30	39	42	57	43	14	22	38	55	34	16	6	29	44	38	44	27	63	62	44	44	42	44	30	32	40	31	56	6
GM19	46	49	-4	7	24	35	48	54	50	45	40	44	21	57	23	26	19	16	64	5	34	23	51	59	32	48	15	39	54	61	48	33	60	1
ST20	40	-16	-23	-25	41	11	45	45	58	39	45	-20	39	52	29	-15	-33	21	11	26	47	8	52	73	37	45	34	41	38	27	42	37	49	1
ST21	35	26	23	-7	25	28	50	61	62	61	33	18	57	65	53	24	-33	52	55	38	51	31	57	60	49	58	45	44	38	27	50	35	55	1
ST22	44	32	29	2	32	24	50	56	62	50	23	19	50	63	45	26	8	27	53	34	45	26	61	61	50	54	41	44	40	37	45	35	52	8
OF23	17	23	8	8	23	18	19	30	17	20	16	17	18	29	21	5	12	16	32	20	29	17	31	30	19	25	28	27	20	19	25	20	36	3
ST24	48	36	37	2	28	13	51	57	62	48	22	33	38	66	40	50	32	10	61	17	61	29	68	68	36	44	56	47	32	21	38	28	61	1
ST25	35	45	25	13	12	14	43	52	40	41	23	33	46	39	40	12	11	8	43	24	34	18	34	44	43	45	25	33	39	41	39	34	47	1

Table B-2 Part 2

B. Standard Deviation of Validity Coefficients

Career Management Field	F[1]	G	CE	CM	CA	H	EI	MC	MK	I	J	K	PA	SK	L	M
CO 1[2]	6	3	6	12	4	2	5	4	5	8	5	3	7	5	6	5
FA 3	16	2	10	1	7	1	14	9	18	16	11	5	7	8	10	1
5	11	14	17	10	15	8	20	18	18	18	16	10	19	20	21	14
SC 6	15	10	5	13	20	14	6	4	11	5	16	13	6	5	8	4
EL 7	10	5	12	9	6	5	11	9	15	12	13	4	6	8	13	8
EL 8	3	8	5	12	8	7	8	7	4	11	9	6	6	4	6	9
MM 9	13	9	11	9	7	10	11	11	14	10	14	12	12	8	11	15
GM11	11	5	13	14	24	13	5	8	9	5	10	9	6	9	3	7
OF12	13	1	11	7	10	10	7	5	6	3	8	3	7	5	4	9
MM13	7	3	13	1	14	15	2	2	7	3	5	8	7	9	6	13
CL14	10	9	10	12	13	6	11	7	8	10	15	11	10	9	9	11
SC15	6	5	5	15	8	5	8	5	7	9	4	10	6	7	8	13
CL16	2	5	7	8	6	6	7	7	5	7	11	6	5	3	4	4
CL18	7	8	11	14	6	10	11	11	7	10	7	15	9	7	7	11
ST22	12	8	5	7	12	9	7	7	7	11	17	7	7	11	9	7
OF23	18	3	12	3	10	11	6	10	0	9	11	6	3	7	7	1

Career Management Field	V	O	TI	AD	ED	AG	WK	AR	A	B	C	AP	D	AI	E	CC	GI
CO 1[2]	13	3	3	5	9	6	6	5	7	10	8	3	4	4	5	5	8
FA 3	11	15	4	15	14	12	10	15	9	5	6	5	1	0	3	6	4
5	13	15	18	13	17	16	18	20	17	16	12	15	15	12	16	12	13
SC 6	4	9	8	13	9	6	5	1	3	6	3	3	8	10	6	4	4
EL 7	18	10	8	7	16	15	6	7	6	9	8	4	8	7	12	8	6
EL 8	18	21	4	10	7	17	3	7	8	2	3	4	5	7	11	6	7
MM 9	12	15	8	13	13	13	11	11	11	9	9	7	6	8	6	7	6
GM11	0	17	2	8	12	5	14	11	9	2	13	4	0	6	1	8	4
OF12	6	7	5	9	13	8	7	3	5	3	2	3	8	6	8	2	3
MM13	3	9	5	7	7	4	6	2	6	3	5	5	3	8	3	4	7
CL14	11	8	8	8	11	15	7	6	6	8	8	7	6	10	8	7	7
SC15	8	6	6	4	9	10	8	6	5	6	4	7	5	4	6	5	5
CL16	8	4	8	8	1	13	4	4	6	1	5	3	5	7	5	4	5
CL18	11	13	10	11	14	14	5	3	7	6	10	4	6	7	7	4	4
ST22	16	13	8	2	21	14	9	11	8	9	7	5	9	6	7	5	8
OF23	7	6	7	2	4	9	8	10	12	5	6	15	5	2	5	11	9

Note: [1] See Table A-1 for test titles.

[2] Row Labels.

1 Infantry/Armor
2 Combat Engineering
3 Field Cannon & Rocket Artillery
4 Field Artillery-Missiles (OF & EL)
5 Air Defense (OF & EL)
6 Combat Surveillance & Target Acquisition
7 Tactical Electronic Equipment Maintenance
8 Fixed Plant Communications Equipment Maintenance
9 Mechanical Maintenance
10 Construction and Utilities
11 Chemical
12 Motor Transport
13 Aircraft Maintenance
14 Administration
15 Communications Operations
16 Finance
17 Data Processing
18 Supply
19 Petroleum
20 Topography & Printing
21 Information Audio Visual
22 Medical
23 Food Service
24 Military Intelligence
25 Special Assignment

Table B-3

BETA WEIGHTS OF TESTS SELECTED IN FIRST ROUND
OF TEST SELECTIONS
(Decimal points omitted)

Career Management Field	Beta Weights WK[1]	AR	MK	B	MC	TI	G	AI	C	AD	F	EI	L	J	K	PA	SK	I	GI	CE	CM	CA	H	CC	M	N	O	AP	No of Samples
IN/AR[2]		18				19				14						13							12						5
COME		15				29				15					13							19							1 (N 400)
FCRA		27	22				27		13																	-11			2
AD		19			18					15		19							13										10
CSTA	22	51			24						-36																	20	4
TEEM			16		19	28			12											20									11
FPCE		29						16				25				14				26									4
MFMA			22			18		25							16			19											17
CONST							28			16							23					24				24			1 (N 20)
CHEM					21			19			22						31			18									2
MTRP								31		-15	18								22			21							3
AIRM		36				18										20		19			25								4
ADM	30	21									14						13					11							4
COOP		22				17										15											11	23	5
FINA	23	31	20							09															-11				3
DATP		29	28	34										-26								36							1
SUPP	24	25								14									18			14							6
INAV					23											24	26	24							-43				1 (N 94)
MEDI		18	23	13								13					23												8
FOOD			-15			17			17										23			11							3
SPAS					29		25				23													16		-14			1 (N 132)

Note [1] See Table A 1 for test titles
[2] See Table B 2 for full titles of Career Management Fields

Table B-4

BETA WEIGHTS OF TESTS SELECTED IN SECOND ROUND
OF TEST SELECTIONS
(Decimal points omitted)

Career Management Field	Beta Weights																		
	WK[1]	AR	MK	MC	TI	G	AI	AD	F	EI	PA	SK	I	GI	CE	CM	CA	CI	AP
IN/AR[2]		18			19			14			13							12	
COME		17			30			16								12	22		
FCRA	07	24	23			24											12		
AD (Repair)		31		22				11		29					12				
TEEM			21	17	22		13								21				
FPCE		29					16			25	14				26				
AD (Oper)							14	23					11	20					
MTRF							30		10					18			19		10
FOOD					13									21			11		11
CSTA	19	27		21							15								14
COOP		17			18				14		16								22
MEMA			18		19		31						20				13		
AIRM		36			18						20		19			25			
GM		11		18			22		14			23							
ADM	38	24							14								11		
FINA	21	30	19					08											
SUPP	24	25						14						18			14		
DATF		35	21									17		15					
MEDI		17	23							15		24							12

Note: 1 See Table A-1 for test titles.
2 See Table B-2 for full titles of Career Management Fields.

Table B-5

BETA WEIGHTS OF TESTS SELECTED IN FINAL ROUND
OF TEST SELECTIONS
(Decimal points omitted)

MOS Group	Beta Weights															
	AR[1]	WK	GI	MK	SK	EI	TI	MC	AI	PA	AP	AD	CC	CA	CE	CM
CO (Combat)	19						21			11		15	12			
FA (Field Artillery)	24		12	22		13								09		
EL (Electronics Repair)	25					19	17	18							18	
OF (Operators and Food)			27						17					15		
SC (Surveillance and Communications)	23	16						16		15	18					
MM (Mechanical Maintenance)				26		15	19		24							16
GM (General Maintenance)	20				24			18	21							
CL (Clerical)	31	34										11		12		
ST (Skilled Technical)	28			25	21											

Note 1 See Table A-1 for test titles

Table B-6 Part 1

MEAN AND STANDARD DEVIATION OF ACB TEST VALIDITY COEFFICIENTS FOR MOS GROUPS
(Decimal points omitted)

MOS Group	ACB Tests																No of Samples
	AR[1]	WK	GI	MK	SK	EI	TI	MC	AI	PA	AP	AD	CC	CA	CE	CM	
	A. Mean Validity Coefficient																
CO[2]	44	39	38	37	41	29	43	41	31	38	34	31	28	28	19	12	6
FA	55	49	45	53	47	42	43	47	29	37	34	25	28	32	29	11	2
EL	58	54	52	54	54	57	57	59	43	49	39	28	32	32	44	17	21
OF	33	30	42	28	33	23	34	34	32	25	27	21	18	23	10	11	10
SC	60	56	49	53	51	42	48	55	34	51	49	30	27	34	34	6	9
MM	55	53	57	53	57	55	62	59	57	50	40	23	34	30	28	34	20
GM	55	51	54	52	60	48	58	55	47	38	30	28	31	32	28	14	4
CL	62	63	52	56	55	40	45	44	29	37	43	34	29	41	21	4	18
ST	62	60	53	60	60	49	50	55	34	49	43	32	35	33	26	-05	13
	B. Standard Deviation of Validity Coefficients																
CO[2]	5	6	7	5	6	5	4	4	4	7	3	4	5	6	6	12	
FA	15	10	4	18	8	14	4	9	0	7	5	15	6	7	10	1	
EL	9	8	7	11	8	10	7	9	8	9	7	10	8	8	11	11	
OF	13	16	11	13	14	10	12	12	13	22	13	17	7	14	10	9	
SC	7	9	5	10	7	10	7	8	9	7	5	10	5	15	6	14	
MM	11	11	7	13	9	10	8	11	7	13	7	12	6	9	12	9	
GM	10	15	8	11	5	7	11	10	16	8	14	5	18	22	13	14	
CL	5	7	7	8	8	11	9	9	9	9	6	9	6	11	10	14	
ST	11	11	7	8	11	6	13	6	7	8	5	6	4	14	15	10	

Table B-6 Part 2

MEAN AND STANDARD DEVIATION OF VALIDITY COEFFICIENTS
OF NON-ACB TESTS FOR MOS GROUPS
(Decimal points omitted)

MOS Group	Non-ACB Tests A[3]	B	C	D	E	F	G	H	I	J	Ed	Age	K	L	M	N	O
	A. Mean Validity Coefficient																
CO[2]	33	30	27	35	22	27	32	14	7	22	31	20	36	40	29	35	35
FA	40	39	26	43	30	28	42	19	-4	32	54	36	41	44	39	28	39
EL	37	42	25	56	33	32	56	25	11	36	42	26	49	53	38	45	55
OF	24	26	16	30	14	22	24	6	4	17	28	14	25	29	28	24	28
SC	36	32	14	46	27	27	42	21	14	35	43	26	49	49	38	34	43
MM	38	53	27	60	39	46	53	19	20	28	41	25	47	57	33	51	56
GM	14	43	27	47	30	32	40	28	19	29	45	27	40	47	24	44	48
CL	50	24	28	42	15	15	34	18	3	33	48	28	40	42	42	28	35
ST	44	29	22	50	24	19	44	24	4	27	47	24	48	53	41	39	44
	B. Standard Deviation of Validity Coefficients																
CO[2]	6	3	3	7	5	5	5	5	10	4	8	6	7	9	7	5	5
FA	16	2	1	16	11	5	10	1	15	15	14	12	9	5	6	1	5
EL	8	8	6	13	15	9	12	10	18	14	14	14	7	7	8	7	11
OF	16	9	9	13	18	11	12	6	9	8	13	11	13	11	9	11	11
SC	15	8	14	8	11	12	8	10	11	8	9	8	6	7	4	7	7
MM	13	8	11	9	12	12	10	15	11	15	13	13	11	9	9	6	6
GM	14	6	11	1	11	9	13	6	8	19	15	17	11	5	13	11	2
CL	9	9	9	10	15	13	8	11	11	10	12	17	7	7	8	6	11
ST	11	15	9	10	16	11	9	15	21	15	17	12	8	9	9	7	6

Note [1] See Table A-1 for titles of ACB tests

[2] See Table B-5 for full titles of MOS groups

[3] Titles of Non-ACB tests.

A Subtraction and Division Test
B Tool Knowledge Test
C General Adjustment Scale
D Science Test
E Electronics Inventory - High
F Electronics Inventory - Low
G Electronics Picture Test
Occupational Interest:
H Biology
I Construction
J General
Ed Years of Education
Age Age in years
K Pattern Analysis (Old)
L Mechanical Aptitude
M Army Clerical Speed
N Shop Mechanics
O Electronics Information (Old)

Table B-7 Part 1

MEAN AND STANDARD DEVIATION OF BETA WEIGHTS FOR 33 VARIABLES
BY MOS GROUP
(Decimal points omitted)

MOS Group	ACB Test AR[1]	WK	GI	MK	SK	EI	TI	MC	AI	PA	AP	AD	CC	CA	CE	CM	No. of Samples
	A. Mean Beta Weight																
CO[2]	09	05	-02	04	02	-05	06	03	07	07	08	11	04	08	-04	02	5
FA	18	02	02	20	-10	09	02	03	-01	-09	01	02	-04	01	-04	-01	2
EL	13	00	04	06	-03	10	08	07	03	00	07	07	00	04	07	-04	17
OF	-03	03	16	-02	-06	-06	04	07	09	02	02	03	-03	11	-04	-01	9
SC	13	08	00	13	02	01	00	05	03	09	10	02	-04	06	10	-02	7
MM	07	00	06	08	04	06	06	06	14	03	05	01	-02	02	02	05	17
GM	06	-06	06	07	14	02	07	08	12	01	-04	08	05	04	07	00	4
CL	13	11	05	11	09	02	03	03	04	03	09	05	-03	10	-03	01	13
ST	05	04	03	06	15	01	12	09	01	09	07	06	-01	11	05	-07	10
	B. Standard Deviation of Beta Weights																
CO[2]	07	09	12	04	06	10	12	05	05	09	04	05	07	08	06	08	
FA	13	03	07	15	09	14	00	00	02	04	00	09	04	02	08	06	
EL	16	09	10	09	12	11	15	11	12	12	10	18	14	08	13	10	
OF	17	15	11	13	10	13	08	07	20	05	11	19	10	10	08	07	
SC	06	06	06	13	09	09	12	05	08	09	05	04	07	10	12	11	
MM	10	11	09	09	11	09	07	10	12	10	07	08	06	10	07	06	
GM	08	14	06	07	10	10	08	04	09	13	06	07	04	05	06	10	
CL	09	11	09	09	11	10	08	08	09	08	07	10	06	14	10	11	
ST	10	11	13	08	12	09	13	15	12	11	05	05	05	10	05	11	

Table B-7 Part 2

MOS Group	A[3]	B	C	D	E	F	G	H	I	J	Ed	Age	K	L	M	N	O
	Non-ACB Tests																
A. Mean Beta Weight																	
CO[2]	01	01	01	03	00	02	-01	-06	01	01	10	02	-03	06	-04	04	07
FA	04	17	06	-08	10	00	-05	09	00	-06	16	09	05	-11	05	-11	03
EL	-02	01	05	04	04	00	01	00	04	01	08	08	11	-03	02	01	04
OF	02	05	05	01	00	06	-04	00	08	01	04	07	-01	-03	11	-05	03
SC	01	02	-02	01	02	01	10	-03	03	04	03	08	07	08	-01	-03	07
MM	05	07	-01	06	02	07	-01	01	05	03	06	14	01	03	03	02	05
GM	06	03	00	-01	-02	01	-04	-02	-01	-08	07	16	04	-04	-05	-02	06
CL	09	00	04	-02	01	-03	00	-02	04	06	00	06	-01	-05	04	-05	03
ST	03	05	02	00	00	06	-05	01	-05	03	10	07	04	08	03	02	01
B. Standard Deviations of Beta Weights																	
CO[2]	09	09	03	10	05	05	07	03	11	03	05	03	10	21	09	09	05
FA	01	05	05	01	03	01	02	02	02	06	04	08	09	02	09	02	06
EL	15	12	10	12	10	14	10	10	09	09	08	08	17	10	15	13	12
OF	21	11	10	18	15	08	15	10	14	06	09	08	10	10	11	10	12
SC	10	07	13	13	08	12	08	09	03	07	06	10	07	09	05	09	08
MM	08	12	09	06	07	10	08	06	08	09	09	08	10	07	09	09	09
GM	13	10	06	12	07	13	10	02	02	10	05	06	05	01	05	03	04
CL	11	10	13	11	07	10	11	13	07	09	10	14	08	09	09	08	06
ST	11	14	07	15	06	11	11	04	13	07	10	09	11	08	09	09	11

Note: [1] See Table A-1 for titles of ACB tests.
[2] See Table B-5 for full titles of MOS groups.
[3] See Table B-6 for titles of non-ACB tests.

Table B-8

BETA WEIGHTS FOR PROPOSED ARMY CLASSIFICATION BATTERY BY MOS GROUP
(Decimal points omitted)

MOS Group	ACB Test															
	AR[1]	WK	GI	MK	SK	EI	TI	MC	AI	PA	AP	AD	CC	CA	CE	CM
CO[2]	13	-02	02	00	04	-05	15	06	06	09	08	13	09		-04	03
FA	23	03	08	21	-02	09	03	08	-02	-04	02	01	03	07	01	07
EL	14	08	04	08	-05	18	12	12	09	05	05	02	-01	06	17	-01
OF	03	01	20	01	00	-06	04	09	13	-01	07	07	-01	14	-07	03
SC	18	12	03	04	-05	02	04	12	08	13	17	03	-02	06	09	-05
MM	08	-02	08	17	04	13	10	04	19	08	07	-03	-01	14	-07	19
GM	13	-13	12	11	15	06	11	12	18	-03	-02	05	02	07	02	-05
CL	22	21	08	14	03	07	00	-04	05	-04	07	09	04	12	-08	-04
ST	15	07	05	18	13	13	-01	07	06	06	08	05	00	04	-05	-10

Note: 1 See Table A-1 for titles of ACB tests.
2 See Table B-5 for full titles of MOS groups.

APPENDIX C

Table C-1

MEAN AND STANDARD DEVIATION OF BETA WEIGHTS FOR HIGH SCHOOL COURSES AND SELECTED VARIABLES BY MOS GROUP
(Decimal points omitted)

MOS Group	Courses and Selected Variables[1]																	No. of Samples
	AR	AI	CE	CM	CA	A	B	C	D	E	F	G	H	I	J	Ed	Age	
	A. Mean Beta Weight																	
CO	20	07	-09	05	08	07	04	04	04	00	00	06	-04	-04	-03	01	06	5
FA	23	04	14	03	00	06	00	-05	-04	07	-11	04	-07	01	-07	23	11	2
EL	18	07	12	-02	03	02	-01	02	-01	02	00	-06	03	-01	-02	07	09	21
OF	03	11	-03	02	11	-02	03	05	03	03	-01	02	01	01	-03	06	10	11
SC	19	01	12	03	02	02	01	-01	-04	05	-01	-05	04	01	-02	06	03	6
MM	13	18	00	06	02	01	01	01	-02	02	00	00	03	01	00	07	18	20
GM	21	13	04	-01	-01	-05	03	01	-03	07	-02	-06	07	01	-05	10	16	5
CL	20	05	02	02	09	-03	-02	-02	-02	-03	-02	-03	03	02	-05	18	05	18
ST	17	03	03	01	07	-05	01	-01	-06	00	07	-04	00	11	-03	17	00	11
	B. Standard Deviation of Beta Weights																	
CO	09	10	13	09	09	13	19	13	06	04	06	03	08	07	08	15	04	
FA	14	00	04	08	00	13	00	05	05	04	02	02	02	04	05	05	07	
EL	17	13	12	11	10	09	10	10	07	08	12	10	09	09	10	12	11	
OF	13	22	09	06	15	12	09	14	09	09	09	13	13	10	10	18	08	
SC	03	10	10	11	07	07	05	04	07	08	09	05	04	11	04	07	12	
MM	12	11	09	08	10	09	09	07	07	09	11	09	09	08	07	09	08	
GM	08	07	13	04	07	07	05	09	04	06	12	05	08	13	15	07	08	
CL	08	11	15	10	13	08	10	10	10	07	08	07	10	07	07	08	12	
ST	12	15	07	11	13	08	06	07	04	06	07	13	10	11	08	19	20	

Note: [1] High School Courses and Selected Variables

AR Arithmetic Reasoning Test
AI Automotive Information Test
CE Electronics Interest Measure
CM Maintenance Interest Measure
CA Attentiveness Interest Measure
A Biology Course
B Chemistry
C General Science
D Electrical Shop
E Hygiene
F Physics
G Earth Science
H Algebra
I Woodworking
J Metalworking
Ed Years of Education
Age in years

APPENDIX D

Table D-1

QUOTAS FOR OLD AND NEW APTITUDE AREA SYSTEM MOS GROUPS

Old Aptitude Area System		New Aptitude Area System	
MOS Group	% of Input	MOS Group	% of Input
IN	21	CO	27
AE	16	RT	08
EL	08	EL	08
GM	05	OF	10
MM	16	SC	06
CL	15	MM	12
GT	16	GM	05
RC	03	CL	12
		ST	12

Table D-2 Part 1

BETA WEIGHTS FOR OPERATIONAL AND EXPERIMENTAL TESTS
(Decimal points omitted)

MOS Group	Operational Tests AR[1]	WK	GI	MK	SK	EI	TI	MC	AI	PA	AP	AD	CC	CA	CE	CM
CO[2]	13	-03	-02	00	06	-06	11	04	-01	08	08	12	08	08	-03	02
FA	24	02	02	16	-03	00	-06	03	-09	-10	-01	-05	01	00	00	09
EL	16	02	02	08	-05	14	07	10	05	02	04	01	-01	05	16	00
OF	03	01	20	-01	01	-07	04	10	14	00	06	05	-02	13	-05	04
SC	23	13	02	08	-02	03	00	10	06	10	18	05	-02	06	10	-07
MM	06	-02	05	13	05	08	04	01	13	06	07	-05	-02	12	-10	16
GM	10	-13	09	11	16	09	09	12	16	-03	-01	05	02	06	02	-09
CL	18	20	06	15	06	08	01	-04	07	-04	06	08	05	11	-06	00
ST	15	04	02	19	14	16	00	06	05	07	06	04	01	06	-03	-07

Table D-2 Part 2

MOS Group	Experimental Tests A[3]	B	C	D	E	F	G	H	I	J	Ed	Age	K	L	M	N	O
CO[2]	00	03	-02	08	05	03	04	01	01	00	-01	12	01	-03	-04	01	[illegible]
FA	10	09	10	-16	03	01	-01	28	-05	07	20	21	02	07	00	-11	00
EL	03	-01	07	02	10	-02	-05	02	-02	01	02	10	-03	05	-06	04	04
OF	-01	-07	10	-08	03	-05	-02	06	10	-04	05	01	03	-05	-08	02	02
SC	04	00	04	-08	05	-06	-16	02	-04	02	02	13	02	-03	-09	15	08
MM	00	02	02	-02	05	-01	06	09	14	02	03	10	06	-06	-06	08	05
GM	04	-07	-13	02	05	02	12	10	03	00	09	09	00	-18	04	09	-05
CL	03	-02	03	-05	04	-01	06	02	02	-04	01	15	-10	-07	-07	10	00
ST	00	07	07	06	03	07	-05	-09	00	03	03	13	-13	-05	03	03	-13

Note: 1 See Table A-1 for titles of ACB (operational) tests.
2 See Table B-5 for full titles of MOS groups.
3 See Table B-6 for full titles of non-ACB (experimental) tests.

Table D-3

INTERCORRELATIONS[a] OF OLD AND NEW ARMY QUALIFICATION BATTERY APTITUDE AREA[b] COMPOSITES
(Decimal points omitted)

	Old AQB System							New AQB System									
MOS Group	IN	AE	EL	GM	MM	CL	GT	CO	FA	EL	OF	MM	GM	CL	ST	ED	AFQT
IN	00	48	51	41	44	57	66	81	65	59	52	57	67	61	67	36	63
AE	48	00	71	66	87	47	55	64	70	72	89	86	76	49	54	35	67
EL	51	71	00	68	79	50	59	66	64	67	70	76	72	55	58	32	72
GM	41	66	68	00	71	36	44	58	50	56	58	71	59	38	44	39	78
MM	44	87	79	71	00	39	48	59	57	67	77	83	74	43	48	24	65
CL	57	47	50	36	39	00	86	72	75	63	59	55	78	83	82	47	72
GT	66	55	59	44	48	86	00	80	89	76	66	69	91	89	99	55	84
CO	81	64	66	58	59	72	80	00	82	78	69	76	82	83	81	44	85
FA	65	70	64	50	57	75	89	82	00	88	84	80	87	88	91	57	79
EL	59	72	67	56	67	63	76	78	88	00	77	90	84	71	76	43	76
OF	52	89	70	58	77	59	66	69	84	77	00	82	81	72	65	50	66
MM	57	86	76	71	83	55	69	76	80	90	82	00	84	61	69	34	76
GM	67	76	72	59	74	78	91	82	87	84	81	84	00	82	90	54	86
CL	61	49	55	38	43	83	89	83	88	71	72	61	82	00	88	58	75
ST	67	54	58	44	48	82	99	81	91	76	65	69	90	88	00	55	84
ED	36	35	32	39	24	47	55	44	57	43	50	34	54	58	55	00	42
AFQT	63	67	72	78	65	72	84	85	79	76	66	76	86	75	84	42	00

[a] The intercorrelations used for mental Category IV personnel (AFQT scores 10-30).

[b] RC and SC aptitude areas omitted.

Table D-4

INTERCORRELATION[a] OF NEW ARMY CLASSIFICATION BATTERY
APTITUDE AREA[b] COMPOSITES
(Decimal points omitted)

	CO	FA	EL	OF	MM	GM	CL	ST	ED	AFQT
CO	00	83	84	71	75	83	83	82	44	84
FA	83	00	88	84	75	85	88	92	61	78
EL	84	88	00	73	86	90	73	83	45	80
OF	71	84	73	00	75	81	74	68	50	67
MM	75	75	86	75	00	85	54	70	36	75
GM	83	85	90	81	85	00	74	88	48	82
CL	83	88	73	74	54	74	00	83	59	73
ST	82	92	83	68	70	88	83	00	61	80
ED	44	61	45	50	36	48	59	61	00	42
AFQT	84	78	80	67	75	82	73	80	42	00

[a] These intercorrelations used for mental Category I, II, and III personnel (AFQT scores 31-100).
[b] SC Aptitude Area omitted.